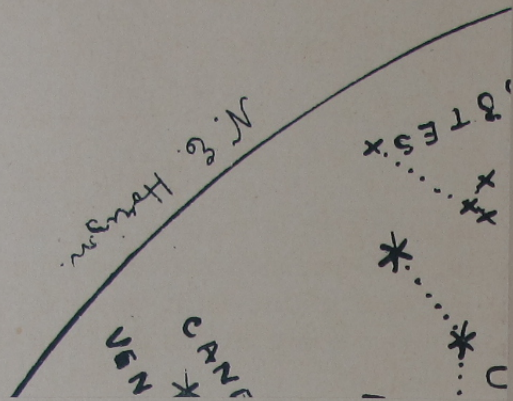




The Evening Sky—December, 1890.

BY MRS. L. C. d'A. LIPSCOMB.

THE SUN.

On December 12th there will be a total eclipse of the Sun, invisible at Greenwich, and also on any known land, for it can only be seen in the latitudes of the vast sea surrounding the South Pole. Only in South Australia will it be visible as a partial eclipse.

On the 21st the Sun enters Capricornus, and Winter commences.

Of all the heavenly bodies the Sun is the most important to us, for it is the centre of our system, round which we revolve, and is, moreover, the source of heat, and therefore life, on our globe. It consequently is of the utmost importance to us to know if we are likely to receive the same amount of heat from the Sun in the future as in the past; and in order to achieve that knowledge we must ascertain what is the composition of the Sun, and what are the laws which govern its existence. No easy task this, considering the great distance (92,897,000 miles) which separates us, and the brilliancy of the light, which renders examination difficult. Notwithstanding these obstacles, our knowledge of the Sun's constitution has increased wonderfully during the last few years.

That part of the Sun which we see on looking at it through a telescope is called the *photosphere*. It does not appear quite smooth, its surface rather resembling rough drawing-paper. This is owing to its being composed of grains of intense brilliance and irregular shape, floating in a darker medium, and arranged in streaks and groups, many of these so-called grains being some hundreds of miles across. With a large telescope these grains resolve themselves into granules—little luminous dots not more than 100 miles or so in diameter. Another feature of the Sun's surface is the long, narrow, blunt-ended filaments, like thatch straw, seen near spots.

Near the edges of the disc the light falls off very rapidly,

and certain peculiar formations called *faculae* (torches) become visible. These are streaks of bright light, often from 5000 to 20,000 miles in length; they move very swiftly, especially when near a spot, 1000 miles an hour being an ordinary rate! They generally herald a spot, and if a large group of *faculae* be seen on the eastern limb (or edge) of the Sun, a large spot is sure to make its appearance there in a day or two. All we can learn of the temperature and constitution of the Sun makes it almost certain that the photosphere is a sheet of self-luminous clouds, the difference between them and our clouds being that the droplets of water which constitute terrestrial clouds are replaced in the solar ones by droplets of molten metal, and the atmosphere in which they float is the flame of a burning fiery furnace, raging with a fury and intensity beyond our power to imagine.

But if, when the observer sees the Sun for the first time through a telescope, there should happen to be visible a large group of spots, they will attract the attention to the exclusion of everything else. In each spot the umbra (or darkest part), with its central nucleus, crossed by bridges, veils, and clouds—the penumbra with its delicate filaments and plumes—the surrounding *faculae*—the agitated surface of the photosphere in the neighbourhood—and the continual change and progress in these varied phenomena—all combine to make a beautiful and most interesting picture.

It is very difficult to determine the nature of spots. No sooner has a theory been established to fit into all known behaviour than some fresh discovery is sure to be made which contradicts it. So far as mere visual appearances are concerned, it looks as if a dark chip or scale were thrown up from beneath—like scum in a cauldron—and floated in the blazing flames of the photosphere, which overhang its edges, bridge across it, and cover it with filmy veils, until at last it disappears.

There is no regular process for the formation of spots; sometimes it is gradual, requiring days, or even weeks, and sometimes one day is sufficient. Generally, before a spot is formed, a disturbance of the surface is apparent, numerous and bright *faculae* appear, among which “pores,” or minute black dots, are scattered. These enlarge, and between them appear grayish patches, in which the photospheric structure is unusually evident, as if they were caused by a dark mass lying behind a veil of thin luminous streaks. This veil seems to grow gradually

thinner, and breaks open, giving us at last the complete spot with its perfect penumbra. During the middle of its life, a spot is almost circular, but towards the beginning and end assumes a much more irregular shape. Its average life may be taken at two or three months, although one is recorded to have lasted eighteen months, and others again have lived only a day or two, or even a few hours. They seldom appear alone, but mostly in groups; as a rule there is one large spot followed by a train of smaller ones, which seem to be imperfect in structure. Sun spots are often enormous in size: many groups have been seen to cover areas of more than 100,000 miles square.

The chromosphere is an outer gaseous envelope of the Sun, composed chiefly of hydrogen, and with a very irregular and variable outline. It seems to be made up of flames, beams, and streamers, surrounding the photosphere. Its exterior and most extensive part is of extreme rarity, resembling comets' tails, and is called the coronal atmosphere. The average depth of the chromosphere is 5000 or 6000 miles, but the flames rise to an enormous height, one exceptionally large having been measured to be 350,000 miles high. These flames are only seen at eclipses of the Sun, and until 1860 it was not certain whether they belonged to the Sun or the Moon. The solar corona is so variable in shape, and appears so different to different observers, that no records of it are trustworthy except photographic ones. It is composed of extremely attenuated gas, the chief component of which is unknown to us on the Earth.

THE MOON.

Last quarter, 4th; new, 12th; first quarter, 18th; full, 26th.

On the 18th there is an occultation of 30 Piscium, of the fifth magnitude. It disappears at 8.35, and reappears at 6.41.

On the 18th, also, an occultation of 33 Piscium, fifth magnitude, from 10.27 to 11.15.

On the 20th, an occultation of ν Piscium, four-and-a-half magnitude, from 7.35 to 8.49.

On the 23rd (the most interesting of all), an occultation of Neptune occurs. He disappears at 9.7, and reappears at 9.38.

THE PLANETS.

Mars can still be seen in the evenings in Aquarius, and is in conjunction with the Moon on the 16th.

Mercury is an evening star.
Jupiter is also still visible in Capricornus.
Saturn in Leo is only rising in the East.
Neptune is nearly overhead, in Taurus.

THE CONSTELLATIONS.

Auriga is on the meridian, and contains a beautiful yellow star called *Capella*, which is so brilliant as to be considered the brightest star in the Northern Hemisphere by some observers. It is at an immense distance, its light requiring eleven years for transmission to us.

Columba Noachi is also on the meridian, in the South, and is at the end of a straight line running from the North Pole through *Auriga*, *Orion* I., and *Lepus*.

Lepus is situated close to *Orion*, at his feet. It contains no brilliant stars, but a good telescopic nebula and group.

Orion is the finest constellation in the sky, and includes three stars of the first magnitude—*Betelgeux*, *Bellatrix*, and *Rigel*. *Betelgeux* is a variable star, being sometimes brighter than *Rigel*, and at other times less brilliant than *Aldebaran*. It is probably leaving us at the rate of twenty-two miles per second. It is yellowish-red in colour, of the hue of a topaz. *Rigel* is probably receding at the rate of fifteen miles per second, and is pale yellow in colour, with a sapphire-blue attendant. The three bright stars across the centre of the constellation are on the belt of *Orion*, the uppermost one—a red star—lying close to the Equator.

The great Fish-mouth Nebula lies near the handle of *Orion*'s sword, which hangs from his belt. It is impossible to describe the beautiful appearance of this wonderful object in a telescope. Interest in it is intensified by each increase of power, which reveals new wonders and alters even its shape, so that it can scarcely be recognised in different instruments. Another cause of its changing aspect is the variability of the brightness of different parts. The spectroscope proves it to be gaseous, although, before its invention, it was held to be resolvable on account of observations made with Lord Rosse's enormous telescope, but the suspected stars have been proved to be only condensations of nebulous matter.

CHRISTMAS CONTRIBUTIONS.

Aschenbrödel: Cantata with Tableaux.

PROLOGUE.

(CHORUS.)

Flow once more, thou fount of pleasure,
 Chant thy songs in gleeful measure !
 Gladden age with joyous spell,
 Bliss bestowing, magic well !

Eyes are sparkling, glancing, beaming,
 Liquid gems in dewdrops gleaming,
 As the friendly Faëry land
 Blithe, we enter, hand in hand.

Flow again, thou fount of pleasure !
 Sing thy songs in joyous measure !
 List ! for tuneful tale they cry—
 Chant the children's lullaby !

MOTHERLESS. (DECLAMATION.)

Upon white bed a-dying
 Lies a woman, wan and fair :
 Her breath comes feebly sighing :
 Her little daughter, crying,
 Sobs out a child's despair ;
 Death's angel, with sharp icy breath,
 Hath kissed the brow of the mother mild.

* * * * *

The orphan's comfortless tears are shed
 O'er that still form upon the bed.

Let husband lay her
 In quiet churchyard,
 Where birds of the air
 Keep kind watch and ward ;

* Adapted from the German of *Heinrich Carsten*, music by *Carl Reinecke*, published by *Siegel*, Leipzig. Parts for each voice can be had separately, music good and charming, but too difficult for children to sing alone. Might be sung in the background while the children perform *tableaux* in front, or, words might be read, reader invisible.